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THE FILICALES FROM THE LOWER GONDWANAS OF HANDAPPA, ORISSA

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ABSTRACT

Sterile filicalean remains from the Kamthi Formation, Handappa, Orissa are discussed. *Pantopteris gracilis* gen. et comb. nov. is proposed for fronds having large, decurrent pinnae with dichotomizing, occasionally anastomosing venation.

Key-words — Filicales, *Pantopteris*, Kamthi Formation, Lower Gondwana (India).

सारॉंश

उड़ीसा में हॅंडप्पा के अधरि गोंडवाना से फिलिकेल्स – शैला चन्द्रा एवं जॉन ऍफ़॰ रिगबी

उड़ीसा में हॅंडप्पा के कामथी शैल-समूह से बन्ध्य फिलिकेली अवशेष विवेचित किये गये हैं। द्विभाजी एवं यदा-कदा शाखामिलनी शिराविन्यास से युक्त बृहत् अधोवर्धी पत्रकों वाले प्रपर्णों के लिए पन्टॉप्टेरिस ग्रेसिलिस वंश व नव संयोजन प्रस्तावित किया गया है।

INTRODUCTION

PALAEOZOIC fern-like fronds referable to form genera are known from many parts of the world. In recent years some Gondwana forms have been recombined under new names on the basis of their morphologies which are distinct from Euramerican forms. As most are sterile, it is not possible to attribute them to any family within the class Pterophyta. Some of these fronds have been found with fertile structures having sporangia with spores and are described under new names, although the occurrence of such forms is rare.

The material described herein comes from a thick bed of hard, compact, buff coloured clayey shale exposed in the Hinjrida Ghati section (20°58′: 84°43′) in the Dhenkanal District of Orissa. The fossils are found as pinkish brown to maroon coloured impressions. Seventy hand specimens of ferns form the basis of this study. The study of other taxa will be presented elsewhere (Shaila Chandra, in preparation; and Shaila Chandra & Rigby, 1981).

DESCRIPTION

Form Genus — *Neomariopteris* Maithy, 1974

Type Species — *Neomariopteris polymorpha* (Feistmantel) Maithy, 1974.

1974 *Neomariopteris* Maithy, p. 70.

The lectotype for *Neomariopteris polymorpha* (Feistmantel) Maithy, 1974 is Geological Survey of India specimen 5165, selected by Surange (1966), from specimens described by Feistmantel (1876). The genus *Neomariopteris* was proposed by Maithy (1974) for fronds previously known as *Sphenopteris* when found in the Lower Gondwanas of India. Later in the same year, Pant and Khare (1974) proposed the genus *Damudopteris* for the same sphenopterid species. This specimen (no. 5165) is sterile.

Pant and Khare included the description of fertile structures in their diagnosis, based on material they had collected, but not on the type collection. If Pant and Khare had nominated one of their fertile specimens as holotype for the type species of *Damudopteris*, then this latter name may stand as the genus for some fertile species of Lower Gondwana ferns whose sterile fronds belong to the form genus *Neomariopteris*. We are convinced that some South American *Neomariopteris* species have fertile fronds distinct from the fertile fronds attributable to *Damudopteris*, e.g. the South American fertile fronds placed in *Ponsotheca* by Bernardes-de-Oliveira (1981). We propose below that *Damudopteris* be redefined and validated as one of the genera for fertile fronds having features of *Neomariopteris* when sterile.

The collection from Handappa includes two species of sterile fern fronds referable to *Neomariopteris*.

Neomariopteris hughesii (Zeiller) Maithy, 1977

Pl. 1, fig. 3

This is the first record of the species from Handappa, where it is the most common fern.

Neomariopteris khanii Maithy, 1977

Maithy (1977) also recorded this fern from Handappa.

Natural Genus — *Damudopteris* Pant & Khare, 1974 emend.

Type Species — Damudopteris bengalensis Chandra & Rigby sp. nov.

1974 *Damudopteris* Pant & Khare, p. 122 (in part)

Damudopteris bengalensis Chandra & Rigby sp. nov.

Lectotype — KP 7026A, Divya Darshan Pant Collection, University of Allahabad, Allahabad, India.

Diagnosis — See Pant and Khare, 1974, pp. 122, 123.

Locality & Horizon — Unknown, from the Raniganj Coalfield, West Bengal; Raniganj Formation.

This new name is proposed for specimens having fertile structures which would have been included in *Neomariopteris polymorpha* (Feistmantel) Maithy, 1977, when sterile. Because of the rarity of fertile specimens, it cannot be demonstrated that all fertile *N. polymorpha* have the same morphology. *N. polymorpha* is a species belonging to the form genus *Neomariopteris* whereas *D. bengalensis* is a species belonging to the natural genus *Damudopteris*. The specific epithet *polymorpha* has not been used as this would imply that all fertile specimens of *N. polymorpha* were *D. bengalensis*, which is completely unsubstantiated.

Pecopteris phegopteroides (Feistmantel) Arber, 1905

Pl. 1, fig. 2

Three specimens of sterile fronds were found.

We have not used Maithy's (1975) recombination *Dizeugotheca phegopteroides* (Feistmantel) Maithy as our material is sterile and the natural genus *Dizeugotheca* is reserved for fertile fern fronds. The form genus *Pecopteris* is used for certain fern and fern-like fronds of unknown affinity (Arber, 1905; Boureau & Doubinger, 1975; and elsewhere). This treatment is consistent with the argument for separating *Neomariopteris* and *Damudopteris* given above.

Genus — *Pantopteris* Shaila-Chandra & Rigby gen. nov.

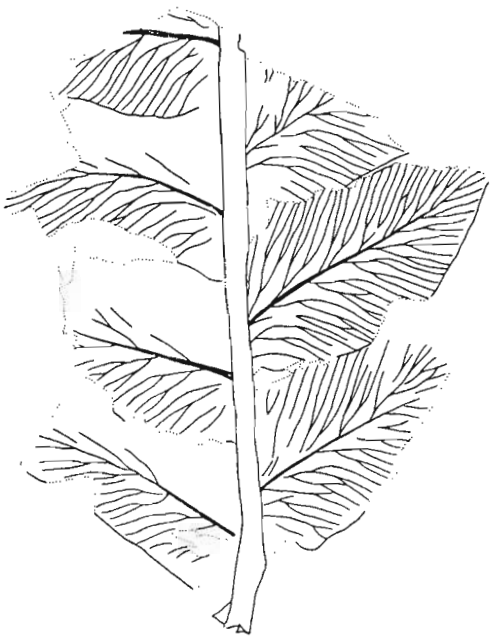
Type Species — Pantopteris gracilis (Lele) Shaila-Chandra & Rigby, comb. nov.

Pantopteris gracilis (Lele) Shaila Chandra & Rigby gen. et comb. nov.

Pl. 1, figs 1, 4; Text-fig. 1

1962 *Danaeopsis gracilis* Lele, p. 74, pl. 2, figs 18-20, text-figs 4-6

Holotype — Lele's specimen no. 8987, BSIP Museum, Lucknow.



TEXT-FIG. 1 — *Pantopteris gracilis* (Lele) Shaila-Chandra & Rigby, gen. et comb. nov., showing prominent pinna costa, and secondary venation with anastomoses forming occasional meshes, specimen no. 5459, × 2.

Diagnosis — Frond pinnate, rachis strong, irregularly ribbed, pinnae almost touching, subopposite, margin entire, decurrent along rachis, branching at about 60° to the rachis; inner costa prominent, extending almost to pinna apex where it breaks up into secondary venation; secondary venation twice, rarely thrice dichotomising towards pinna base, reducing to once, or rarely not dichotomising towards apex; anastomoses rare up to three in each pinna, usually basiscopically towards costa and associated with vein dichotomies but may occur anywhere, secondary venation rare in decurrent portion.

Description — In all, there are five specimens belonging to this genus in the collection. The frond is pinnate. The biggest frond which seems to be complete, measures 7.5 cm in length. The main rachis is quite strong, irregularly ribbed, up to 1.5 mm wide at the base, and without a wing. The pinnae almost touch each other. They have an entire margin, decurrent along rachis, and are subopposite. Each pinna receives a single vein from the pinna rachis which runs up to 3/4 of the pinna length and then divides into secondary venation. The pinnae are 14-32 mm in length along the midrib and 8-13 mm wide at half length. The secondary veins dichotomize twice, rarely thrice, in the basal part of the pinnae, whereas they may be unbranched towards the apical portion. There are occasional anastomoses towards the midrib, no more than five have been observed in any individual pinna.

Comparison & Discussion — Lele (1962) included two specimens of fern fragments from the Upper Triassic Parsora Formation in the genus *Danaeopsis*. We have compared our specimens with Lele's and found no characters to separate them even though our specimens come from the Upper Permian Kamthi Formation. These specimens cannot be placed in *Danaeopsis* because of the anastomoses in the pinnae venation.

Bunbury (1861, p. 332, pl. 10, fig. 1) described a fern fragment from Kamthi as "*Cladophlebis* ?". The sketch shows a few pinnae, one appearing to have a cross connection. Without inspecting the specimen, we are unable to confirm it as a record of *Pantopteris*.

The only fronds known to us that have a similar pattern of anastomoses are the morphologically dissimilar *Scoresbya* from the Jurassic of Greenland and elsewhere. Holmes (1977) based *Dunedoonia*, from the Permian of New South Wales on a fragment of a pinnate frond with pinnules lacking a midrib, but having a reticulate venation. Reticulations were frequent. A similar venation pattern occurs in the Laurasian Carboniferous genera *Linopteris* and *Lonchopteris*. The Cathaysian genus *Gigantopteris* has pseudoanastomoses caused by fusion between adjacent pinnules.

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EXPLANATION OF PLATE

1. *Pantopteris gracilis* (Lele) Chandra & Rigby, gen. et comb. nov., specimen enlarged to show anastomosing venation, decurrent pinnae and strong rachis, specimen no. 35459. × 4.
2. *Pecopteris phegopteroides* (Feistm.) Maithy, specimen no. 35452. × 1.
3. *Neomariopteris hughesii* (Zeiller) Maithy, specimen no. 35453. × 1.
4. *Pantopteris gracilis* (Lele) Shaila-Chandra & Rigby, gen. et comb. nov., specimen no. 35459. × 1.

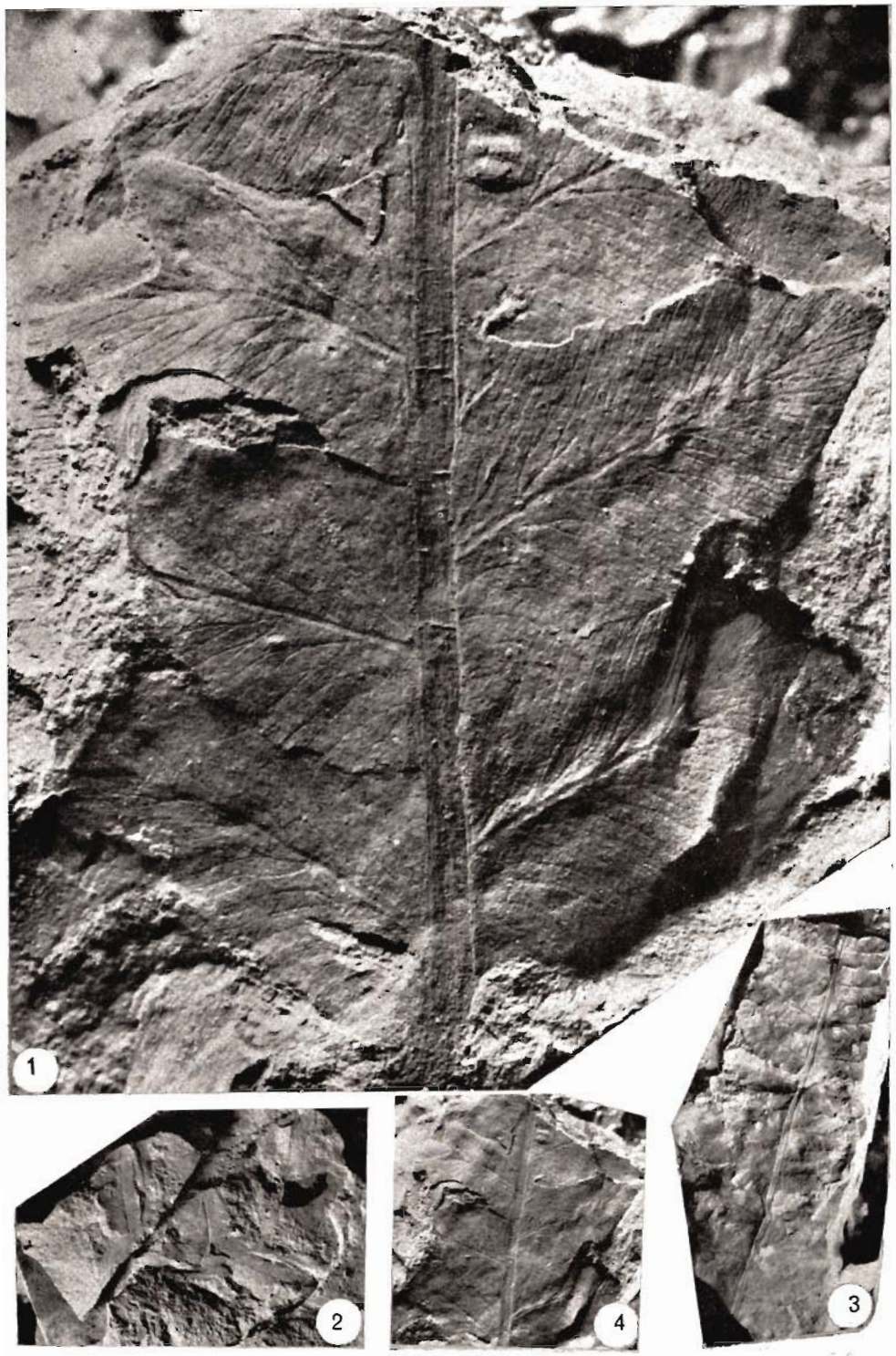

PLATE 1